

**REMARKS**

Claims 1-9, 22-25 and 28-39 are all the claims pending in the application. Claim 7 has been amended to recite an oxidation initiation temperature of not less than 60°C, and support for the amendment to claim 7 can be found, for example, in original claim 4 and at page 15, lines 26-27 of the present specification.

Claims 2, 3 and 7 have also been amended to correct typographical error.

Entry of the above amendments is respectfully requested as not raising any new issues requiring further search and/or consideration by the Examiner.

Applicants also submit herewith a copy of the verified English translation of Provisional Application No. 60/121,436 from which benefit is claimed under 35 U.S.C. § 119(e).

Applicants also submit herewith the executed Declaration pursuant to 37 C.F.R. § 1.132 of Akinori Sudoh, a co-inventor of the present application. The test data in the Declaration shows that the carbon material powder of Hase et al. does not meet the terms of the present claims. The significance of the test data is discussed in further detail below.

**I. Response to Rejection of Claims 1-9 and 30-33 under 35 U.S.C. § 103(a)**

Claims 1-9 and 30-33 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Hase et al. (US 5,910,383) in view of Greinke et al. (US 5,677,082).

Applicants respectfully traverse.

An important feature of the carbon material of the present invention is (1) the oxidation initiation temperature of not less than 600°C. According to this feature, decomposition of an electrolytic solution is reduced, resulting in a long cycle life because the carbon material has a low chemical activity (reactivity) (see page 4, lines 5-11 and page 14, lines 5-8 on page 14 of

the present specification). Another important feature of the carbon material is (2) the  $C_{50}$  value of less than  $6.720\text{\AA}$ . According to this feature, crystallinity of the carbon material is improved, the charge and discharge capacity of a battery can be increased, and specific electric resistance can be decreased (see page 19, lines 2-5 of the present specification).

Hase et al. aims to provide a carbon material economically, and discloses a method of manufacturing a carbon material by forming a mesophase pitch, and subjecting the mesophase pitch to grinding, oxidizing, carbonization, and graphitizing. The method forms the mesophase pitch without using the conventional process of adding a solvent to a heat-treated pitch and then separating the mesophase pitch particles alone by centrifugation.

In the Examples of Hase et al., mesophase pitch having an aspect ratio not greater than 2, containing fine particles of  $2\text{ }\mu\text{m}$  and smaller in an amount not greater than 3 wt. %, and having an average particle size of  $16\text{ }\mu\text{m}$  is formed. The carbon material obtained in Example 1 of Hase et al. has a similar specific surface area, aspect ratio, and average particle size as that of the carbon material of the present invention. However, as shown in the Declaration under 37 C.F.R. § 1.132 submitted herewith, the oxidation initiation temperature of carbon material cannot be determined from the specific surface area, aspect ratio, and average particle size alone. Rather, carbon material having a similar specific surface area, aspect ratio, and average particle size to that of the present invention, does not necessarily have an oxidation initiation temperature of not less than  $600^{\circ}\text{C}$ . In addition, a carbon material having a  $C_{50}$  value of less than  $6.720\text{ }\text{\AA}$  was not obtained.

Greinke et al. aims to provide compacted carbon useful in an electrode, and discloses, as the compacted carbon, carbon having a high x-ray density, that is, having a small  $C_{50}$  value.

However, there is no description or suggestion in Greinke et al. of carbon material having an oxidation initiation temperature of not less than 600 °C or its effect in the present invention.

In Greinke et al., x-ray density of a carbon is considered to relate to both precursor and heat-treatment temperature (see col. 8, last two lines). Regarding the precursor, Greinke et al. discloses that since the x-ray density is relatively low in carbons derived from nongraphitizing carbon starting materials, even when heated to the highest temperatures, such carbon starting materials are not preferred (see col. 4, lines 22-27). Regarding heat-treatment temperature, Greinke et al. discloses that the x-ray density of the carbon is increased by processing carbon starting materials to the highest temperature possible, and to achieve maximum x-ray density, these carbon starting materials are heated from 2000 to 3000°C (preferably to about 2500°C) (see col. 4, lines 11-19).

In Example 1 of Hase et al., the mesophase pitch particles used as carbon starting materials were heated at 3000°C to graphitize the same. The heat temperature of 3000°C is the highest temperature disclosed in Greinke et al.; however, the Co value of the carbon material obtained in Example 1 of Hase et al. is 6.73 Å outside the scope of the present claims. As the nongraphitizing carbon starting materials disclosed in Greinke et al., the Co value of the carbon material formed from the mesophase pitch particles of Hase et al. is high even when heated to the highest disclosed temperature.

Therefore, one of ordinary skill in the art would not be motivated to combine Greinke et al. and Hase et al. since the mesophase pitch particles of Hase et al. are not preferable as starting materials of Greinke et al. Even assuming, *arguendo*, that there were some motivation to combine Greinke et al. and Hase et al., since the heat temperature of 3000°C is the highest

temperature disclosed in Greinke et al., there is no teaching or suggestion to graphitize the mesophase pitch particles of Hase et al. at an even higher temperature.

Accordingly, Greinke et al. and Hase et al. fail to teach or suggest the present invention according to claims 1-4 and 7 having an oxidation initiation temperature of not less than 600°C and a Co value of less than 6.720 Å.

In addition, each of claims 5-6, 8-9 and 30-33 depend, either directly or indirectly, from claims 1-4 and 7, and it is respectfully submitted that these claims are patentable for at least the same reasons that claims 1-4 and 7 are patentable over the cited prior art.

In view of the above, withdrawal of the foregoing rejection is respectfully requested.

**II. Response to Rejection of Claims 1-9, 22-25, 30-33 and 39 under 35 U.S.C. § 103(a)**

Claims 1-9, 22-25, 30-33 and 39 were rejected under 35 U.S.C. 103(a) as being unpatentable over Hase et al. in view of Tamaki et al. (US 5,698,341).

Applicants respectfully traverse.

Tamaki et al. discloses that a boric compound exerts the effects of promoting graphitization and increasing the charge and discharge capacities when used in a negative electrode of a battery by conducting the graphitization at temperatures close to the melting point of the boric compound (the melting points of boron and boron carbide being 2080°C and 2450°C, respectively) (see from last line in col. 12, to line 6 in col. 13). In Example 9, carbon microbeads are obtained by adding boron carbide in an amount of 5% by weight to mesocarbon microbeads, and heating to 2700°C to graphitize the mesocarbon microbeads. The Co value of the obtained carbon microbeads is 6.17Å.

As described above, the carbon material of Hase et al. does not have an oxidation initiation temperature of not less than 600°C. Also, even when the mesophase pitch particles in Example 1 of Hase et al. are heated at 3000°C to graphitize them, the Co value of the obtained carbon material is 6.73 Å, outside the scope of the present claims. Namely, it is relatively difficult to graphitize the mesophase pitch particles of Hase et al.

In contrast, in the present invention, in order to reduce the chemical activity, carbon material made from easily-graphitized carbon materials such as cokes is preferable (see page 16, lines 4-6 of the present specification).

Therefore, even if Tamaki et al. and Hase et al. were somehow combined, and a boric compound was added to the mesophase pitch particles of Hase et al. and then the mesophase pitch particles were graphitized, it would have been difficult to reduce the chemical activity, and a carbon material having an oxidation initiation temperature of not less than 600 °C cannot be obtained.

Accordingly, Tamaki et al. and Hase et al. do not teach or suggest the present invention according to claims 1-4 and 7 having an oxidation initiation temperature of not less than 600°C and a Co value of less than 6.720 Å.

In addition, each of claims 5-6, 8-9, 22-25, 30-33 and 39 depend, either directly or indirectly, from claims 1-4 and 7, and it is respectfully submitted that these claims are patentable over the cited prior art for at least the same reasons as claims 1-4 and 7.

In view of the above, withdrawal of the foregoing rejection is respectfully requested.

**III. Response to Rejection of Claims 1-9, 22-25, 30-33 and 39 under 35 U.S.C. §**

**103(a)**

Claims 1-9, 22-25, 30-33, and 39 were rejected under 35 U.S.C. 103(a) as being unpatentable over Tamaki et al. taken with Hase et al.

Applicants respectfully traverse as follows.

As noted above, Tamaki et al. and Hase et al. do not disclose a carbon material having an oxidation initiation temperature of not less than 600°C.

In addition, Hase et al. discloses particle sizes of the mesophase fine powder of Example 1. However, the Examiner has not provided any reason why one of ordinary skill in the art would be motivated to use the mesophase fine powder of Hase et al. in Tamaki et al. The Examiner's reasoning appears to be based on the fact that the mesophase fine powder of Hase et al. possesses properties that overlap with those of the present invention. If that is the case, then the rejection is improper as being based on what Applicants teach in their specification.

Furthermore, the Examiner assumes that the use of the fine powder of Hase et al. in Tamaki et al. would yield a graphite having the same properties as the graphite obtained in Hase et al. (except for the Co value, which the Examiner presumably believes will be less than 6.733 Å). Tamaki et al. teaches that artificial graphites such as graphite fibers have crystallites of various size and configuration and an impurity content, etc., depending on the type of the starting material and the manufacturing conditions (see col. 2, lines 64-67). Therefore, even if the mesophase fine powder of Hase et al. were used in the process of Tamaki et al., the resulting graphite powder does not necessarily possess the claimed

properties of the present invention, such as a lattice spacing of less than 6.720 Å or a surface area of not more than 3 m<sup>2</sup>/g.

For example, differences in temperature during graphitization may affect the properties of the graphite. In this regard, Tamaki et al. discloses that graphitization without the use of boric compound is about 700°C higher than when boric compound is used (see col. 13, lines 7-16). Hase et al. discloses graphitizing at a temperature of 3000°C, which results in graphite having a surface area of 0.85 m<sup>2</sup>/g. Therefore, graphitizing at different temperatures may result in different properties.

For the foregoing reasons, Tamaki et al. and Hase et al. do not teach or suggest the present invention according to claims 1-4 and 7 having an oxidation initiation temperature of not less than 600°C and a Co value of less than 6.720 Å.

In addition, each of claims 5-6, 8-9, 22-25, 30-33 and 39 depend, either directly or indirectly, from claims 1-4 and 7, and it is respectfully submitted that these claims are patentable over the cited prior art for at least the same reasons as claims 1-4 and 7.

In view of the above, withdrawal of the foregoing rejection is respectfully requested.

**IV. Rejection of Claims 1-9, 22-25, 30-33 and 39 under 35 U.S.C. § 103(a)**

Claims 1-9 and 30-33 were rejected under 35 U.S.C. 103(a) as being unpatentable over Hase et al. in view of Greinke et al. and further in view of Ozaki et al. (US 5,344,724).

In addition, claims 1-9, 22-25, 30-33, and 39 are rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over Hase et al. in view of Tamaki et al. and further in view of Ozaki et al.

Applicants respectfully traverse.

Hase et al. discloses that a vacuum distillation residual pitch is subjected to heat treatment until the content of quinoline-insoluble components thereof becomes 50 to 80 wt. %, whereby the pitch is converted into a mesophase pitch. By this process, the mesophase pitch can be formed without a conventional process of adding a solvent such as quinoline or toluene to a heat-treated pitch and then separating mesophase pitch particles alone by centrifugation. As a result, a carbon material ensuring high performance can be economically provided at a high yield based on a simple procedure without using any solvent such as quinoline or toluene.

In contrast, in Ozaki et al., graphitic particles are produced by subjecting mesophase particles used as a precursor to carbonization, and then heat-treating through graphitization (see claim 1). The method for producing the graphitic particles of Ozaki et al. uses mesophase particles as a precursor and a graphitization temperature of 2500°C to 2900°C. The mesophase particles are produced by heat-treating a pitch in a molten state to produce carbonaceous mesophase particles, and extracting and separating the mesophase particles. In the process of extracting and separating the mesophase particles, a solvent is added to a heat-treated pitch and then mesophase pitch particles are separated alone by centrifugation or the like.

Accordingly, there is no motivation that would lead one of ordinary skill in the art to combine Ozaki et al. and Hase et al. This is because Ozaki et al. discloses producing mesophase particles using a solvent, whereas Hase et al. discloses producing mesophase particles without using a solvent. Therefore, Ozaki et al. and Hase et al. do not teach or suggest the present invention according to claims 1-4 and 7 having an oxidation initiation temperature of not less than 600°C and a Co value of less than 6.720 Å

In addition, each of claims 5-6, 8-9, 22-25, 30-33 and 39 depend, either directly or



indirectly, from claims 1-4 and 7, and it is respectfully submitted that these claims are patentable over the cited prior art for at least the same reasons as claims 1-4 and 7.

In view of the above, withdrawal of the rejection is respectfully requested.

**V. Response to Rejection of Claims 1-9, 22-25, 30-33, and 39 under 35**

**U.S.C. § 103(a)**

Claims 1-9, 22-25, 30-33, and 39 are rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over Tamaki et al. taken with Hase et al. and further in view of Ozaki et al.

Applicants respectfully traverse.

In the Examples of Ozaki et al., the graphitization temperature can be correlated with the physical properties of the produced graphitic particles indicating the degree of graphitization. As shown in the measured energy density and output voltage in the Examples, a graphitization temperature of 2500°C to 2900°C is an essential feature of Ozaki et al.

In contrast, as described above, Tamaki et al. discloses that a boric compound exerts the effects of promoting graphitization and increasing the charge and discharge capacities when used in a negative electrode of a battery by conducting the graphitization at temperatures close to the melting point of the boric compound (the melting points of boron and boron carbide being 2080°C and 2450°C, respectively).

Therefore, one of ordinary skill in the art would not be motivated to combine Ozaki et al. and Tamaki et al. because the preferred graphitization temperature of Ozaki et al. in which a boric compound is not used is different from the graphitization temperature of Tamaki et al.

in which the boric compound is used, and the graphitization mechanism of Ozaki et al. must be different from that of Tamaki et al.

Accordingly, Ozaki et al. and Tamaki et al. do not teach or suggest the present invention according to claims 1-4 and 7 having an oxidation initiation temperature of not less than 600°C and a Co value of less than 6.720 Å.

In addition, each of claims 5-6, 8-9, 22-25, 30-33 and 39 depend, either directly or indirectly, from claims 1-4 and 7. Thus, it is respectfully submitted that these claims are patentable over the cited prior art for at least the same reasons as claims 1-4 and 7.

In view of the above, withdrawal of the rejection is respectfully requested.

**VI. Response to Rejection of Claims 28-29 under 35 U.S.C. § 103(a)**

Claims 28-29 were rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over Hase et al. in view of Greinke et al. alone, or further in view of Ozaki et al., and further in view of Yoneda et al. (US 5,591,547).

In addition, claims 28-29 were rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over Hase et al. in view of Tamaki et al. alone, or further in view of Ozaki et al., and further in view of Yoneda et al.

Further, claims 28-29 were rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over Tamaki et al. taken with Hase et al. alone, or further in view of Ozaki et al., and further in view of Yoneda et al.

Applicants respectfully traverse.

Each of claims 28-29 depend, directly or indirectly, from claims 1-4 and 7. Applicants rely on the response above with respect to the rejections over Hase et al. in view of Greinke et

al. alone, or further in view of Ozaki et al.; Hase et al. in view of Tamaki et al. alone, or further in view of Ozaki et al.; and Tamaki et al. taken with Hase et al. alone, or further in view of Ozaki et al.

In addition, Yoneda et al. teaches polyvinylidene fluoride as a specific binding material. However, Yoneda et al. uses a graphite composite powder having copper oxide particles formed at least on a part of the surface of graphite particles, and there is no teaching or suggestion of the carbon material of the present invention.

In view of the above, withdrawal of the foregoing rejections is respectfully requested.

**VII. Rejoinder**

Withdrawn claims 34 to 38 are directed to manufacturing the carbon material for a lithium battery as claimed in claim 1, 2, 3, 4 and 7, respectively. If the product claims are allowable, then Applicants respectfully request rejoinder of the withdrawn method claims, which include all of limitations of the corresponding product claims pursuant to MPEP § 821.04.

**VIII. Conclusion**

In conclusion, the §102 and §103 rejections should be overcome, and in view of the above, it is respectfully submitted that the claims are in condition for allowance.

Reconsideration and withdrawal of the rejections, and the allowance of claims 1-9, 22-25 and 28-39 at an early date are respectfully requested.

If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

**AMENDMENT UNDER 37 C.F.R. § 1.116**  
**U.S. Application No. 09/807,075**

**Attorney Docket Q53366**

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